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**CHEMISTRY  
STANDARD LEVEL  
PAPER 1**

Thursday 8 May 2008 (afternoon)

45 minutes

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**INSTRUCTIONS TO CANDIDATES**

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The periodic table is provided for reference on page 2 of this examination paper.



The Periodic Table

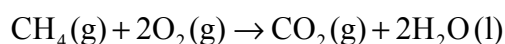
1	2	3	4	5	6	7	0										
<div>1 H 1.01</div>		<div>Atomic Number</div> <div>Element</div> <div>Atomic Mass</div>					<div>2 He 4.00</div>										
<div>3 Li 6.94</div>	<div>4 Be 9.01</div>						<div>9 F 19.00</div>										
<div>11 Na 22.99</div>	<div>12 Mg 24.31</div>						<div>17 Cl 35.45</div>										
<div>19 K 39.10</div>	<div>20 Ca 40.08</div>	<div>21 Sc 44.96</div>	<div>22 Ti 47.90</div>	<div>23 V 50.94</div>	<div>24 Cr 52.00</div>	<div>25 Mn 54.94</div>	<div>26 Fe 55.85</div>	<div>27 Co 58.93</div>	<div>28 Ni 58.71</div>	<div>29 Cu 63.55</div>	<div>30 Zn 65.37</div>	<div>31 Ga 69.72</div>	<div>32 Ge 72.59</div>	<div>33 As 74.92</div>	<div>34 Se 78.96</div>	<div>35 Br 79.90</div>	<div>36 Kr 83.80</div>
<div>37 Rb 85.47</div>	<div>38 Sr 87.62</div>	<div>39 Y 88.91</div>	<div>40 Zr 91.22</div>	<div>41 Nb 92.91</div>	<div>42 Mo 95.94</div>	<div>43 Tc 98.91</div>	<div>44 Ru 101.07</div>	<div>45 Rh 102.91</div>	<div>46 Pd 106.42</div>	<div>47 Ag 107.87</div>	<div>48 Cd 112.40</div>	<div>49 In 114.82</div>	<div>50 Sn 118.69</div>	<div>51 Sb 121.75</div>	<div>52 Te 127.60</div>	<div>53 I 126.90</div>	<div>54 Xe 131.30</div>
<div>55 Cs 132.91</div>	<div>56 Ba 137.34</div>	<div>57 † La 138.91</div>	<div>72 Hf 178.49</div>	<div>73 Ta 180.95</div>	<div>74 W 183.85</div>	<div>75 Re 186.21</div>	<div>76 Os 190.21</div>	<div>77 Ir 192.22</div>	<div>78 Pt 195.09</div>	<div>79 Au 196.97</div>	<div>80 Hg 200.59</div>	<div>81 Tl 204.37</div>	<div>82 Pb 207.19</div>	<div>83 Bi 208.98</div>	<div>84 Po (210)</div>	<div>85 At (210)</div>	<div>86 Rn (222)</div>
<div>87 Fr (223)</div>	<div>88 Ra (226)</div>	<div>89 ‡ Ac (227)</div>															
†																	
			<div>58 Ce 140.12</div>	<div>59 Pr 140.91</div>	<div>60 Nd 144.24</div>	<div>61 Pm 146.92</div>	<div>62 Sm 150.35</div>	<div>63 Eu 151.96</div>	<div>64 Gd 157.25</div>	<div>65 Tb 158.92</div>	<div>66 Dy 162.50</div>	<div>67 Ho 164.93</div>	<div>68 Er 167.26</div>	<div>69 Tm 168.93</div>	<div>70 Yb 173.04</div>	<div>71 Lu 174.97</div>	
‡																	
			<div>90 Th 232.04</div>	<div>91 Pa 231.04</div>	<div>92 U 238.03</div>	<div>93 Np (237)</div>	<div>94 Pu (242)</div>	<div>95 Am (243)</div>	<div>96 Cm (247)</div>	<div>97 Bk (247)</div>	<div>98 Cf (251)</div>	<div>99 Es (254)</div>	<div>100 Fm (257)</div>	<div>101 Md (258)</div>	<div>102 No (259)</div>	<div>103 Lr (260)</div>	



1. How many molecules are present in a 9.0 g sample of water?

- A. 0.5
- B. 1.0
- C.  $6.0 \times 10^{23}$
- D.  $3.0 \times 10^{23}$

2. What volume of carbon dioxide is formed when 8 g of methane burns completely at room temperature and pressure? (1 mole of a gas occupies  $24 \text{ dm}^3$  at room temperature and pressure.)

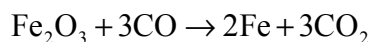


- A.  $8 \text{ dm}^3$
- B.  $12 \text{ dm}^3$
- C.  $16 \text{ dm}^3$
- D.  $24 \text{ dm}^3$

3. 28 g of metal M reacted with 8 g of oxygen to form an oxide with the formula MO. What is the relative atomic mass of M?

- A. 14
- B. 28
- C. 56
- D. 112

4. What is the maximum mass of iron that can be produced from the reduction of 80 tonnes of iron(III) oxide ( $M_r = 160$ ), based on this equation?



- A. 28 tonnes
- B. 56 tonnes
- C. 84 tonnes
- D. 112 tonnes



5. Which species represent a pair of isotopes?

Species	Number of protons	Number of electrons	Number of neutrons
L	12	12	12
M	13	13	13
P	13	10	13
Q	12	12	14

- A. L and M
- B. L and P
- C. P and Q
- D. L and Q

6. Bromine exists as the isotopes  $^{79}\text{Br}$  and  $^{81}\text{Br}$ . What is the percentage of  $^{79}\text{Br}$  in a sample with a relative atomic mass of 79.9?

- A. 40%
- B. 45%
- C. 50%
- D. 55%

7. Which properties decrease in value when descending group 1?

- I. Atomic radius
  - II. Ionization energy
  - III. Electronegativity
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III



8. The ionization energies of three consecutive elements in the periodic table are 1680, 2080 and 494 kJ mol<sup>-1</sup> respectively. Which of the following shows the elements with these values?
- A. O F Ne
- B. F Ne Na
- C. Ne Na Mg
- D. Na Mg Al
9. Which substance will **not** conduct an electric current?
- A. C(s)(graphite)
- B. NaF(l)
- C. CaO(s)
- D. KI(aq)
10. Which of the following liquids is non-polar?
- A. Water
- B. Hexane
- C. Propanone
- D. Ethanol
11. The following substances all contain a nitrogen to nitrogen bond: N<sub>2</sub>, N<sub>2</sub>H<sub>4</sub>, N<sub>2</sub>H<sub>2</sub>. Which shows them in **increasing** order of nitrogen to nitrogen bond length (smallest first)?
- A. N<sub>2</sub>H<sub>4</sub>, N<sub>2</sub>H<sub>2</sub>, N<sub>2</sub>
- B. N<sub>2</sub>, N<sub>2</sub>H<sub>2</sub>, N<sub>2</sub>H<sub>4</sub>
- C. N<sub>2</sub>H<sub>2</sub>, N<sub>2</sub>H<sub>4</sub>, N<sub>2</sub>
- D. N<sub>2</sub>H<sub>4</sub>, N<sub>2</sub>, N<sub>2</sub>H<sub>2</sub>



12. Which molecules have a bond angle of  $109.5^\circ$  or less?

- I.  $\text{NH}_3$
- II.  $\text{CO}_2$
- III.  $\text{CHCl}_3$

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

13. The temperature of  $1 \text{ dm}^3$  of a gas is increased from  $32^\circ\text{C}$  to  $64^\circ\text{C}$  at constant pressure. What is the new volume in  $\text{dm}^3$ ?

- A. 1.1
- B. 1.3
- C. 1.6
- D. 2.0

14. Which statement about evaporation is correct?

- A. The liquid must be heated for evaporation to occur.
- B. The liquid must be at its boiling point for evaporation to occur.
- C. High energy particles leave the surface of the liquid as evaporation occurs.
- D. The liquid becomes warmer as evaporation occurs.



15. The heat produced when 0.01 mol of ethanol was burned raised the temperature of 100 g of water by 20°C. The specific heat capacity of water is 4.2 J g<sup>-1</sup> K<sup>-1</sup>.

Which is the correct expression for the magnitude of the enthalpy of combustion of ethanol in J mol<sup>-1</sup>?

- A.  $\frac{100 \times 4.2 \times 20}{0.01}$
- B.  $\frac{100 \times 4.2 \times 0.01}{20}$
- C.  $\frac{4.2 \times 20 \times 0.01}{100}$
- D.  $\frac{20 \times 100 \times 0.01}{4.2}$

16. Which change does **not** lead to an increase in entropy?

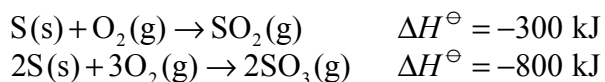
- A. Mixing nitrogen and oxygen gases at room temperature
- B. Cooling steam so that it condenses to water
- C. Heating hexane to its boiling point
- D. Dissolving sugar in water

17. Which combination is correct for an endothermic reaction taking place in solution?

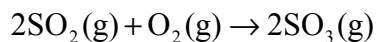
	$\Delta H$	Temperature of solution
A.	+	increases
B.	+	decreases
C.	–	increases
D.	–	decreases



18. The enthalpy changes for two reactions are shown below.



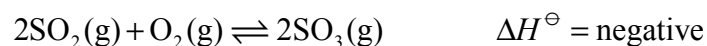
What is the enthalpy change for this reaction in kJ?



- A. –200
- B. –500
- C. –1100
- D. –1400
19. In the collision theory, what is important in determining whether a collision results in a chemical reaction?
- I. The kinetic energy of the molecules
  - II. The orientation of the molecules
  - III. The collision frequency of the molecules
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III
20. Which units could be used for the rate of a chemical reaction?
- A.  $\text{mol dm}^{-3} \text{ min}$
- B.  $\text{mol}^{-1} \text{ min}^{-1}$
- C.  $\text{dm}^3 \text{ min}$
- D.  $\text{mol dm}^{-3} \text{ min}^{-1}$



21. Which change will increase the equilibrium concentration of sulfur trioxide in this reaction?



- A. Decreasing the concentration of oxygen
  - B. Increasing the pressure
  - C. Using a catalyst
  - D. Increasing the temperature
22. Which change increases the pH of a solution from 3 to 6?
- A. Doubling the  $[\text{H}^+]$
  - B. Halving the  $[\text{OH}^-]$
  - C. Decreasing the  $[\text{H}^+]$  by a factor of 1000
  - D. Decreasing the  $[\text{OH}^-]$  by a factor of 1000
23. Which pair of compounds, in aqueous solution, could be used to make a buffer solution?
- A.  $\text{CH}_3\text{COOH}$  and  $\text{HCl}$
  - B.  $\text{HCl}$  and  $\text{NaOH}$
  - C.  $\text{HCl}$  and  $\text{NH}_4\text{Cl}$
  - D.  $\text{HCOOH}$  and  $\text{NaOH}$
24. In which species does chromium have an oxidation number of +3?
- A.  $\text{CrO}_4^{2-}$
  - B.  $\text{Cr}_2\text{O}_7^{2-}$
  - C.  $\text{CrO}_3$
  - D.  $\text{Cr}(\text{OH})_3$



25. In which reaction does hydrogen act as an oxidizing agent?
- A.  $\text{Ca} + \text{H}_2 \rightarrow \text{CaH}_2$
  - B.  $\text{F}_2 + \text{H}_2 \rightarrow 2\text{HF}$
  - C.  $\text{C}_2\text{H}_2 + \text{H}_2 \rightarrow \text{C}_2\text{H}_4$
  - D.  $\text{O}_2 + 2\text{H}_2 \rightarrow 2\text{H}_2\text{O}$
26. Which of these occur during the electrolysis of molten sodium chloride?
- I. Electrons flow through the connecting wires
  - II. Molten sodium forms at the positive electrode
  - III. Reduction occurs at the negative electrode
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III
27. How many structural isomers are there with the formula  $\text{C}_5\text{H}_{12}$ ?
- A. 2
  - B. 3
  - C. 4
  - D. 5



28. Which is the correct formula of 2,3-dichloro-2-methylpentane?
- A.  $\text{CH}_3\text{CCl}(\text{CH}_3)\text{CHClCH}_2\text{CH}_3$
  - B.  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CCl}_2\text{CH}_2\text{CH}_3$
  - C.  $\text{CH}_3\text{CCl}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_3$
  - D.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHClCHClCH}_3$
29. What type of reaction occurs when hexanedioic acid and 1,6-diaminohexane react together to form nylon?
- A. Addition
  - B. Condensation
  - C. Esterification
  - D. Substitution
30. What product results from the reaction of  $\text{CH}_3\text{CH}=\text{CH}_2$  with  $\text{Br}_2$ ?
- A.  $\text{CH}_3\text{CHBrCH}_2\text{Br}$
  - B.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
  - C.  $\text{CH}_3\text{CHBrCH}_3$
  - D.  $\text{CH}_3\text{CH}_2\text{CHBr}_2$
-